What is claimed is:

1. An image processing apparatus for generation of an outputting image by color-processing to convert a color image described in a control language for an output unit being used (hereinafter referred to as outputting control language) into color data adapted for said output unit, said image processing apparatus comprising:

command image processing means for generating an image having color information by a pixel (hereinafter referred to as pixel image) by performing said color-processing on color data of a command image on the basis of color palette information given to the bits belonging to a region specified by the drawing command, said command image generated by drawing command.

2. An image processing apparatus for generation of an outputting image by color-processing to convert a color image described in an outputting control language for an output unit being used into color data adapted for said output unit wherein photo image processing means for processing a photo image having color information by a pixel processing means for processing a photo image generated from bit map data comprises:

color number compacting means for deciding on at least one kind of representative color by compacting the color data of said photo image;

representative color processing means for color-processing of said representative color; and

image restoring means for converting said photo image into said bit map image on the basis of said color-processed representative color.

3. An image processing apparatus for generation of an outputting

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image by color-processing to convert a color image described in an outputting control language for an output unit being used into color data adapted for said output unit, said image processing apparatus comprising:

object image separating means for separating said color image data into a command image generated by the drawing command and a photo image having color information by a pixel, generated from the bit map data on the basis of information contained in said outputting control language;

command image processing means for generating a first pixel image by performing said color-processing on color data of said command image on the basis of color palette information given to a region specified by the drawing command and;

photo image processing means for generating a second pixel image by performing said color-processing on the color data of said photo image; and

image synthesizing means for generating said outputting image by synthesizing said first pixel image and said second pixel image.

4. The image processing apparatus as defined in claim 1 ~~or claim 3~~ wherein said command image processing means comprises:

color palette information extracting means for extracting said color palette information on said command image;

extracted palette color processing means for performing said color-processing on the basis of said color palette information; and

image drawing means for converting said command image into said first pixel image on the basis of said color-processed color palette information.

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5. The image processing apparatus as defined in claim 3 wherein said photo image processing means comprises:

color number compacting means for deciding on at least one kind of representative color by compacting the color data of said photo image;

representative color processing means for color-processing of said representative color; and

image restoring means for converting said photo image into said second pixel image on the basis of said color-processed representative color.

6. The image processing apparatus as defined in claim 2 ~~or claim 5~~ wherein said color number compacting means comprises:

image dividing means for dividing said photo image into a plurality of image blocks; and

representative color deciding means for deciding on at least one kind of representative color for each of said blocks on the basis of color data statistical distribution of pixels in said block.

7. The image processing apparatus as defined in claim 6 wherein said representative color deciding means comprises:

initializing means for deciding on an initial representative color vector from a group of color vectors with the color data – of the respective color pixels within a specific region obtained from the object image – as factor;

division axis deciding means for deciding on the axis direction in which each cluster obtained at the present moment is divided;

cluster dividing means for replacing the representative color vector of the object cluster with two tentative representative color vectors which

are a certain distance apart with the present position of the representative color vector of the object cluster as center in the axis direction obtained by said division axis deciding means;

cluster representative deciding means for deriving representative color vectors representing the respective clusters by classifying into the respective clusters groups of all the color vectors within a specific region on the basis of the tentative representative color vectors obtained by said cluster dividing means; and

convergence judging means for judging whether the representative color vectors converge by comparing the tentative representative color vector obtained by said cluster dividing means and the representative color vector obtained by said cluster representative deciding means.

8. The image processing apparatus as defined in claim 7 which further comprises cluster division end judging means for judging whether the number of the latest representative color vectors found converged by said convergence judging means and the clusters represented by them satisfies the pre-set specific number of cluster divisions.

9. The image processing apparatus as defined in claim 8 which comprises representative information outputting means for outputting the latest representative color vectors and information on the clusters to which the color vectors of the respective pixels belong — with regard to all the pixels within the object region area — when said cluster division end judging means judges that said cluster division is over.

10. The image processing apparatus as defined in claim 6 wherein said representative color deciding means comprises:

initializing means for deciding on an initial representative color vector from a group of color vectors with the color data – of the respective color pixels within a specific region obtained from the object image – as factor,

5   in-cluster variance deriving means for calculating the variance of distance between the representative color vectors representing the clusters obtained at the present moment and the color vectors belonging to said clusters;

division suspension judging means for judging whether to divide
10   the clusters on the basis of the variance of the respective clusters obtained by said in-cluster variance deriving means,

division axis deciding means for – with regard to the respective clusters obtained at the present moment – deciding on the axis direction in which the clusters will be divided when said division suspension judging
15   means 61 judges that the division will not be suspended,

cluster dividing means for replacing the representative color vector of the object cluster with two tentative representative color vectors which are a certain distance apart with the present position of the representative color vector of the object cluster as center in the axis
20   direction obtained by said division axis deciding means;

cluster representative deciding means for deriving representative color vectors representing the respective clusters by classifying into the respective clusters groups of all the color vectors within a specific region on the basis of the tentative representative color vectors obtained by said
25   cluster dividing means; and

convergence judging means for judging whether the representative color vector converges by comparing the tentative representative color vector obtained by said cluster dividing means and the representative

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color vector obtained by said cluster representative deciding means.

11. The image processing apparatus as defined in claim 10 which further comprises cluster division end judging means for judging whether the number of the latest representative color vectors found converged by said convergence judging means and the clusters represented by them satisfies the pre-set specific number of cluster divisions.

12. The image processing apparatus as defined in claim 11 which comprises representative information outputting means for outputting the latest representative color vectors and information on the clusters to which the color vectors of the respective pixels belong — with regard to all the pixels within the object region — when said cluster division end judging means judges that said cluster division is over.

13. The image processing apparatus as defined in claim 2 ~~or claim 6~~ wherein said image restoring means generates said second pixel image by restoring pixel images in all said image blocks after said representative colors are decided on for all said image blocks.

14. The image processing apparatus as defined in claim 2 ~~or claim 6~~ wherein said image restoring means generates said second pixel image by carrying out a series of procedures for restoring the pixel image on each of said blocks in addition to deciding on said representative colors.

15. The image processing apparatus as defined in claim 2 ~~or claim 6~~ which comprises image interpolation means for generating said second pixel image by interpolating the colors on the pixel image generated by

image restoring means.

16. The image processing apparatus as defined in claim 2 ~~or claim 3~~ wherein said photo image processing means comprises:

5   image smoothing means for generating said second pixel image by smoothing the colors on the pixel image generated by said image restoring means.

17. The image processing apparatus as defined in claim 2 ~~or claim 5~~ wherein said color number compacting means comprises:

10   region adjusting means for generating the optimum image blocks by changing the size of said image blocks on the basis of the statistical distribution of the color data of the pixels in said image blocks.

18. The image processing apparatus as defined in claim 17 wherein said region adjusting means comprises:

15   luminance distribution deriving means for working out the mean luminance and luminance variance of the pixels in the object image block; and

20   block uniting means for uniting an object image block and its neighboring image block in case the difference between the object image block and its neighboring image block in the calculated mean luminance and luminance variance is smaller than a specific value.

25   19. An image processing apparatus for generation of an outputting image in which color image data prepared by application is converted into an outputting control language for the output unit being used and held in a memory storage and at the same time the data is color-processed for

conversion into color data adapted for said output unit, said image processing apparatus comprising:

color number compacting means for deciding at least one kind of representative color by compacting the color data of said photo image generated from bit map data contained in said color image data; and

outputting control language converting means for converting into outputting control language said photo image for which the representative color is decided on.

20. An image processing apparatus for generating an outputting image in which color image data prepared by application is converted into an outputting control language for the output unit being used and held in a memory storage and at the same time the data is color-processed for conversion into color data adapted for said output unit, said image processing apparatus comprising:

object image separating means for separating said color image into a command image generated by drawing command and a photo image having color information by a pixel, generated from bit map data on the basis of information contained in the color image data;

color number compacting means for deciding on at least one kind of representative color by compacting the color data of said photo image; and

outputting control language converting means for converting into outputting control language said command image and said photo image for which the representative color is decided on.

21. The image processing apparatus as defined in claim 20 which comprises command image processing means for generating a first pixel image by performing said color-processing on color data of said command

image in said outputting control language on the basis of color palette information given to the bits belonging to a region specified by the drawing command.

5   22. The image processing apparatus as defined in claim 19 ~~or claim 20~~ which comprises photo image processing means for generating a second pixel image by performing said color-processing on the color data of said photo image in said outputting control language.

10   23. The image processing apparatus as defined in claim 19 ~~or claim 20~~ which comprises:

object image separating means for separating said outputting control language into a command image and a photo image having color information by a pixel on the basis of information contained in said

15   outputting control language;

command image processing means for generating a first pixel image by performing said color-processing on color data of said command image on the basis of color palette information given to the bits belonging to a region specified by the drawing command;

20   photo image processing means for generating a second pixel image by performing said color-processing on the color data of said photo image; and

image synthesizing means for generating said outputting image by synthesizing said first pixel image and said second pixel image.

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24. The image processing apparatus as defined in claim 21 ~~or claim 23~~ wherein said command image processing means comprises:

color palette information extracting means for extracting said color

palette information on said command image;

extracted palette color processing means for performing said color-processing on the basis of said color palette information; and

image drawing means for converting said command image into said first pixel image on the basis of said color-processed color palette information.

25. The image processing apparatus as defined in claim 22 ~~or claim 23~~ wherein said photo image processing means comprises:

representative color processing means for color-processing of said representative color; and

image restoring means for converting said photo image into said second pixel image on the basis of said color-processed representative color.

26. The image processing apparatus as defined in claim 19 ~~or claim 20~~ wherein said color number compacting means comprises:

image dividing means for dividing said photo image into a plurality of image blocks; and

representative color deciding means for deciding on at least one kind of representative color for each of said blocks on the basis of color data statistical distribution of pixels in said block.

27. The image processing apparatus as defined in claim 26 wherein said representative color deciding means comprises:

initializing means for deciding on an initial representative color vector from a group of color vectors with the color data — of the respective color pixels within a specific region obtained from the object image — as

factor,

division axis deciding means for deciding on the axis direction in which the respective clusters obtained at the present moment are divided;

cluster dividing means for replacing the representative color vector of the object cluster with two tentative representative color vectors which are a certain distance apart with the present position of the representative color vector of the object cluster as center in the axis direction obtained by said division axis deciding means;

cluster representative deciding means for deriving representative color vectors representing the respective clusters by classifying into the respective clusters groups of all the color vectors within a specific region on the basis of the tentative representative color vectors obtained by said cluster dividing means; and

convergence judging means for judging whether the representative color vector converges by comparing the tentative representative color vector obtained by said cluster dividing means and the representative color vector obtained by said cluster representative deciding means.

28. The image processing apparatus as defined in claim 27 which further comprises cluster division end judging means for judging whether the number of the latest representative color vectors found converged by said convergence judging means and the clusters represented by them satisfies the pre-set specific number of cluster divisions.

29. The image processing apparatus as defined in claim 28 which comprises representative information outputting means for outputting the latest representative color vectors and information on the clusters to which the color vectors of the respective pixels belong — with regard to all

the pixels – when said cluster division end judging means judges that said cluster division is over.

30. The image processing apparatus as defined in claim 26 wherein said representative color deciding means comprises:

initializing means for deciding on an initial representative color vector from a group of color vectors with the color data – of the respective color pixels within a specific region obtained from the object image – as factor;

in-cluster variance deriving means for calculating the variance of distance between the representative color vectors representing the clusters obtained at the present moment and the color vectors belonging to the clusters;

division suspension judging means for judging whether to divide the clusters on the basis of the variance of the respective clusters obtained by said in-cluster variance deriving means,

division axis deciding means for deciding on the axis direction in which the respective clusters obtained at the present moment will be divided when said division suspension judging means judges that the division will not be suspended,

cluster dividing means for replacing the representative color vector of the object cluster with two tentative representative color vectors which are a certain distance apart with the present position of the representative color vector of the object cluster as center in the axis direction obtained by said division axis deciding means;

cluster representative deciding means for deriving representative color vectors representing the respective clusters by classifying into the respective clusters groups of all the color vectors within a specific region

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on the basis of the tentative representative color vectors obtained by said cluster dividing means; and

convergence judging means for judging whether the representative color vector converges by comparing the tentative representative color vector obtained by said cluster dividing means and the representative color vector obtained by said cluster representative deciding means.

31. The image processing apparatus as defined in claim 30 which further comprises cluster division end judging means for judging whether the number of the latest representative color vectors found converged by said convergence judging means and the clusters represented by them satisfies the pre-set specific number of cluster divisions.

32. The image processing apparatus as defined in claim 31 which comprises representative information outputting means for outputting the latest representative color vectors and information on the clusters to which the color vectors of the respective pixels belong — with regard to all the pixels — when said cluster division end judging means judges that said cluster division is over.

33. The image processing apparatus as defined in claim 19 ~~or claim 20~~ wherein said color number compacting means comprises;

region adjusting means for generating the optimum image blocks by changing the size of said image blocks on the basis of the statistical distribution of the color data of the pixels in said image blocks.

34. The image processing apparatus as defined in claim 33 wherein said region adjusting means comprises:

luminance distribution deriving means for working out the mean

luminance and luminance variance of the pixels in the object image block;

and

block uniting means for uniting an object image block and its

5   neighboring image block in case the difference between the object image

block and its neighboring image block in the calculated mean luminance

and luminance variance is smaller than a specific value.

35. The image processing apparatus as defined in claim 25 wherein

10   said image restoring means generates said second pixel image by restoring

pixel images in all said image blocks after said representative colors are

decided on for all said image blocks.

36. The image processing apparatus as defined in claim 25 wherein

15   said image restoring means generates said second pixel image by carrying

out a series of procedures for restoring the pixel image on each of said

blocks in addition to deciding on said representative colors.

37. The image processing apparatus as defined in claim 22 or claim

20   23 wherein said photo image processing means comprises:

image interpolation means for generating said second pixel image

by interpolating the colors on the pixel image generated by said image

restoring means.

25   38. The image processing apparatus as defined in claim 22 or claim

23 wherein said photo image processing means comprises:

image smoothing means for generating said second pixel image by

smoothing the colors on the pixel image generated by said image restoring

means.

39. The image processing apparatus as defined in ~~any of claims 1, 2,~~
~~3, 19 and 20~~ wherein said outputting control language is a printer
5   description language.

40. The image processing apparatus as defined in ~~any of claims 1, 2,~~
~~3, 19 and 20~~ wherein said outputting control language is a display control
language adapted for the display unit.

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41. The image processing apparatus as defined in ~~any of claims 1, 2,~~
~~3, 19 and 20~~ wherein said outputting control language is a language
adapted for GDI (Graphical Device Interface).

15   42. An image processing method for generation of an outputting
image by color-processing to convert a color image described in an
outputting control language adapted for said output unit (hereinafter
referred to as outputting control language) into color data for said output
unit, said method comprising a procedure of processing a command image
20   to generate a pixel image by performing said color-processing on the color
data of the command image generated by the drawing command on the
basis of color palette information given to bits belonging to a region
specified by said drawing command.

25   43. An image processing method for generation of an outputting
image by color-processing to convert a color image described in an
outputting control language adapted for said output unit into color data
for said output unit wherein the photo image processing procedure for

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generation of a pixel image corresponding to a photo image having color information by a pixel generated from bit map data comprising the steps of:

compacting the color data of the photo image to decide at least one kind of representative color;

color-processing said representative colors; and

restoring an image by converting said photo image into a pixel image on the basis of said color-processed representative colors.

44. An image processing method for generation of an outputting image by color-processing to convert a color image described in an outputting control language adapted for said output unit into color data for said output unit, said image processing method comprising the steps of:

separating said color image into a command image generated by the drawing command and a photo image having color information by a pixel generated by the bit map data on the basis of information contained in said outputting control language;

processing the command image to generate a first pixel image by performing color-processing on the color data of said command image on the basis of color palette information given to the bits belonging to a region specified by the drawing command;

processing the photo image for generating a second pixel image by performing said color-processing on the color data of said photo image; and

generating said outputting image by synthesizing said first pixel image and said second pixel image.

45. The image processing method as defined in claim 43 or claim 44

wherein said photo image processing step divides the photo image into a plurality of blocks, decides at least one representative color within each of said image blocks and performs color-processing on said representative color.

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46. The image processing method as defined in claim 43 ~~or claim 44~~ wherein said photo image processing procedure comprises the steps of:

compacting the color data of the photo image to decide on at least one kind of representative color;

10   color-processing said representative colors; and

restoring an image by converting said photo image into said second pixel image on the basis of said color-processed representative color.

47. An image processing method for generation of an outputting

15   image in which color image data prepared by application is converted into an outputting control language for the output unit being used and held in a memory storage and at the same time the data is color-processed for conversion into color data adapted for said output unit, said image processing method comprising the steps of:

20   compacting the color data of the photo image having color information by a pixel generated from bit map data contained in said color image data to decide at least one kind of representative color; and

converting into the outputting control language said photo image of which the representative color is decided on.

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48. An image processing method for generation of an outputting image in which color image data prepared by application is converted into an outputting control language for the output unit being used and held in

a memory storage and at the same time the data is color-processed for conversion into color data adapted for said output unit, said image processing method comprising the steps of:

separating said color image into a command image generated by the drawing command and a photo image having color information by a pixel generated by the bit map data on the basis of information contained in said outputting control language;

compacting the color data of the photo image to decide on at least one kind of representative color; and

converting into the outputting control language said command image and said photo image of which the representative color is decided on.

49. The image processing method as defined in claim 47 ~~or claim 48~~ which further comprises the steps of:

color-processing said representative colors on the photo image converted into said outputting control language; and

restoring an image by converting said photo image into said second pixel image on the basis of said color-processed representative color.

50. The image processing method as defined in ~~any of claims 42, 43, 44, 47, and 48~~ claim 47 wherein said outputting control language is Printer Description Language.

51. The image processing method as defined in ~~any of claims 42, 43, 44, 47, and 48~~ claim 47 wherein said outputting control language is a display control language adapted for the display unit.

52. The image processing method as defined in any of claims 42, 43, 44, 47, and 48 wherein said outputting control language is a language adapted for GDI (Graphical Device Interface).

5   53. A recording medium in which an image processing procedure for generating an outputting image by color-processing for converting a color image described in an outputting control language adapted for the output unit being used into color data adapted for the output unit is recorded as computer program wherein the following steps are recorded as the photo

10   image processing procedure for processing a photo image having color information by a pixel generated from a pixel image:

compacting the color data of the photo image to decide on at least one kind of representative color;

color-processing said representative colors; and

15   restoring an image by converting said photo image into a pixel image on the basis of said color-processed representative color.

54. A recording medium in which an image processing procedure for generating an outputting image by color-processing for converting a color

20   image described in an outputting control language adapted for the output unit being used into color data adapted for the output unit is recorded as computer program wherein the following steps are recorded:

object image separating step for separating said color data into a command image generated by the drawing command and a photo image

25   having color information by a pixel generated by the bit map data on the basis of information contained in said outputting control language;

command image processing step for generation of the first bid map image by color-processing the color data of said command image on the

basis of color palette information given to bits belonging to a region specified by said drawing command;

photo image processing step for generation of the second pixel image by performing said color-processing on the color data of said photo

5   image; and

image synthesizing step for generating said outputting image by synthesizing said first pixel image and said second pixel image.

55. The recording medium as defined in claim 53 ~~or claim 54~~

10   wherein the following steps are recorded:

color number compacting step for deciding on at least one representative color by compacting the color data of said photo image;

representative color processing step for color-processing said representative color; and

15   image restoring step for converting said photo image into said second pixel image on the basis of said color-processed representative color.

56. A recording medium in which an image processing procedure for

20   generating an outputting image by converting color image data prepared by application into an outputting control language adapted for the output unit being used, holding in a memory storage and at the same time performing color-processing for converting into color data adapted for the output unit is recorded as computer program wherein the following steps

25   are recorded:

Color number compacting step for deciding at least one kind of representative color by compacting the color data of the photo image having color information by a pixel generated from bit map data contained

in said color image data; and

outputting control language converting step for converting into the outputting control language said photo image of which said representative color is decided on.

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57. A recording medium in which an image processing procedure for generation of an outputting image by converting color image data prepared by application into an outputting control language and holding the data in a memory storage and at the same time by color-processing for conversion

10 into color data adapted for said output unit is recorded as computer program wherein the following steps are recorded:

object image separating step for separating said color image data into a command image generated by the drawing command and a photo image having color information by a pixel generated by the bit map data

15 on the basis of information contained in said color image data;

color number compacting step for deciding on at least one representative color by compacting the color data of said photo image; and

outputting control language converting step for converting into the outputting control language said command image and said photo image of

20 which said representative color is decided on.

58. The recording medium as defined in claim 57 ~~or claim 58~~ wherein the following steps are recorded:

representative color processing step for further color-processing

25 said representative color on the photo image converted into said outputting control language; and

image restoring step for converting said photo image into said second pixel image on the basis of said color-processed representative

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color.